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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/672,968	09/25/2003	Peter G. Tolchinsky	42P16684	3614

8791 7590 09/15/2005

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EXAMINER

WILSON, CHRISTIAN D

ART UNIT PAPER NUMBER

2891

DATE MAILED: 09/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/672,968

Applicant(s)

TOLCHINSKY ET AL.

Examiner

Christian Wilson

Art Unit

2891

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 05 July 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-3,5,6,9,10 and 15-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3,5,6,9,10 and 15-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 September 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Drawings***

1. The drawings are objected to because they contain hand drawn figures and label numbers. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Official Notice***

2. Official notice is taken that silicon carbide (SiC) has a thermal conductivity that is greater than the thermal conductivity of silicon (Si). This is supported by the applicant’s specification [0023] and Hummel (*Electronic Properties of Materials*) [Table 19.3].

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1 – 3, 5, 6, 9, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kub *et al.* in view of Ghyselen *et al.*

Kub *et al.* (US 6,323,108) teaches a process comprising forming a splitting layer **12** within the semiconductor substrate **10**, bonding the substrate directly to a bulk heat dissipation [column 4, lines 43-44] substrate **18** having a thermal conductivity greater than that of the substrate, and splitting the substrate along the splitting layer [column 6, line 41]. Kub *et al.* does not discuss depositing the bulk heat dissipation substrate by chemical vapor deposition (CVD). Ghyselen *et al.* (US 6,867,067) teaches depositing a SiC substrate [column 6, lines 60-65]. It would have been obvious to one of ordinary skill in the art to deposit the bulk heat dissipation substrate as taught by Ghyselen *et al.* in the method of Kub *et al.* since this alternate method of forming a bulk heat dissipation substrate provides improved growth rate and deposition parameter adjustment [column 7, lines 10-15].

Regarding claim 2, Kub *et al.* further teaches a bulk heat dissipation substrate of SiC [column 6, line 59].

Regarding claim 3, Kub *et al.* further teaches a bulk heat dissipation substrate which is a material that removes heat from the semiconductor substrate [column 6, lines 60-67].

Art Unit: 2891

Regarding claims 5 and 6, Kub *et al.* further teaches forming the splitting layer by implanting hydrogen in the semiconductor substrate [column 5, lines 55-65].

Regarding claim 9, Kub *et al.* does not discuss a chemical vapor deposition technique for depositing the SiC substrate. Ghyselen *et al.* teaches a CVD deposition method. It would have been obvious to one of ordinary skill in the art to use the CVD method of Ghyselen *et al.* in the method of Kub *et al.* since this method provides a low temperature method of depositing a SiC substrate as taught by Ghyselen *et al.*

Regarding claim 10, Kub *et al.* further teaches forming a transition layer on the bulk heat dissipation substrate which is silicon nitride or polysilicon [column 7, lines 5-10] and then bonding the transition layer to the substrate [Figure 1B].

5. Claims 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kub *et al.* in view of Letertre *et al.*

Kub *et al.* teaches a process comprising providing a silicon wafer **10**, implanting hydrogen in the semiconductor substrate [column 5, lines 55-65; Figure 1A], bonding a SiC layer **18** [Figure 1B], and splitting the substrate along the implantation layer **12** [Figure 1C]. Kub *et al.* does not discuss depositing the SiC layer by CVD or polishing the silicon layer or SiC layer. Letertre *et al.* (US 6,815,309) teaches depositing a 0.5 mm thick SiC layer by using CVD [column 6, line 62; column 7, line 3] and polishing the SiC and Si layers [column 6, lines 5-10]. It would have been obvious to one of ordinary skill in the art use the SiC layer of Letertre *et al.* with the polishing steps in the method of Kub *et al.* since this provides a Si and SiC layers by a typical deposition method with adjustable thicknesses which is compatible with further processing technologies.

Art Unit: 2891

6. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kub *et al.* and Letertre *et al.* as applied to claim 15 above, and further in view of Lam *et al.*

Kub *et al.* as modified by Letertre *et al.* teach the limitations of claim 15 as described above, but they do not discuss the polished thickness of the SiC layer. Lam *et al.* (US 2005/0060115) teaches a 300 mm wafer which has a final thickness of 0.775 mm [0006]. It would have been obvious to one of ordinary skill in the art to polish the SiC layer to a thickness of between 0.75 mm and 0.8 mm since this is the industry standard thickness for 300 mm wafers.

#### ***Response to Arguments***

7. Applicant's arguments filed July 5, 2005 have been fully considered but they are not persuasive.

Applicant argues that Kub *et al.* does not teach a method of forming a splitting layer, depositing a bulk heat dissipation substrate, and then splitting the semiconductor substrate. Applicant further argues that neither Ghyselen *et al.* or Lam *et al.* correct this deficiency. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Kub *et al.* teaches forming a splitting layer, bonding a bulk heat dissipation device, and splitting the substrate. Ghyselen *et al.* and Lam *et al.* are used to provide the missing step of depositing the bulk heat dissipation device as an alternate method to the bonding method of Kub *et al.* The further teachings of Ghyselen *et al.* and Lam *et al.* regarding substrate processing are irrelevant to this combination since they do

Art Unit: 2891

not teach away from the combination of Kub *et al.* with Ghyselen *et al.* or Kub *et al.* with Lam *et al.* These combinations teach all the limitations of the claimed invention as describe above. The analysis of each reference individually does not overcome the rejections based on a combination of the references.

### ***Conclusion***

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christian Wilson whose telephone number is (571) 272-1886. The examiner can normally be reached on weekdays, 7:30 AM to 4 PM.

Art Unit: 2891

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Baumeister can be reached on (571) 272-1722. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Christian Wilson', with a large, stylized loop at the end.

Christian Wilson, Ph.D.  
Primary Examiner  
Art Unit 2891

CDW